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FAO PLANT PROTECTION BULLETIN

is issued as a medium for the dissemination of information received by the World Reporting Service on Plant Diseases and Pests, established in accordance with the provisions of the International Plant Protection Convention, 1951. It publishes reports on the occurrence, outbreak and control of pests and diseases of plants and plant products of economic significance and related topics, with special reference to current information. No responsibility is assumed by FAO for opinions and viewpoints expressed in the Bulletin.

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MAN AND HUNGER

This pamphlet is mainly intended for teachers in secondary schools. It is hoped that it will help stimulate teachers' interest in the world problem of food and the work of the Food and Agriculture Organization. It is also hoped that it will supply teachers with useful data for the presentation of these subjects in the classroom. FAO, like the United Nations and the other Specialized Agencies, is becoming increasingly convinced that the public understanding necessary for the accomplishment of its tasks must start in the schools. This pamphlet, issued in co-operation with Unesco, is an outcome of that understanding. Criticisms, comments and suggestions are welcomed from all users.

* * *

The first issue in the same series *Nutrition and Society*, consisting of a lecture given by the late Professor André Mayer of France to inaugurate a course for nutrition workers at Marseilles in late 1955, a short biography of Professor Mayer and an account of FAO's work in the nutrition field, is still available from FAO Sales Agents or from Headquarters.

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World Reporting Service on Plant Diseases and Pests

Plant Quarantine in the Philippines

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Philippine agriculture, due to the prevailing climatic conditions in the country, is replete with problems, among which the control of pests, diseases and noxious weeds is a very serious one. It is obvious that measures need to be taken in the Philippines to combat indigenous pests and diseases and attention focussed on the possibility of the introduction of pests through the importation of plant materials for various uses from abroad.

At present there are pests and diseases causing serious damage, some of which, such as coconut cadang-cadang and abaca mosaic, pose an actual threat to the major agricultural industries. Annual loss sustained has been estimated to be at least 30 percent of the total production of crops. There are also numerous pests and diseases which are still unknown in the Philippines, and which, if accidentally introduced, may eventually gain a foothold and cause further destruction to agricultural crops.

In addition to planting materials, the Philippines imports annually for consumption a considerable amount of fruit and vegetables (Table 1). In order to prevent the introduction of plant diseases and pests through such imports, the Government has introduced quarantine rules and regulations and established a plant quarantine service to enforce them.

Introduced Diseases and Pests

Some of the pests and diseases which are inflicting serious losses to Philippine crop production have been introduced from abroad. Coffee rust (*Hemileia vastatrix*), which was introduced from Arabia in 1885 (2), was the cause of the decline of the once thriving coffee industry in Lipa, Batangas. Losses have been estimated at millions of pesos. Citrus canker, caused by *Xanthomonas citri*, which was also introduced from overseas (1,7), has been a great menace to the citrus industry. Two other important prewar introductions are Fiji disease of sugar cane, which was supposedly introduced from Australia with cane cuttings produced in the Fiji islands (6), and Panama disease (*Fusarium oxysporum* var. *cubense*) of bananas, which was introduced from Panama, and which is damaging the commercial Latundan variety of banana wherever it is grown. Recently, Ocfemia (3) gave experimental evidence that abaca mosaic in the Philippines might be traced back to the introduction of chrysanthemum.

Records show that sporadic cases of rice blast (*Piricularia oryzae*) were first noted in 1917 and again in 1921 (4). In 1937, it was observed on introduced rice seed, but the entire importation was intercepted and destroyed. During the postwar period, when seed supply was critical, the disease was again observed in 1947 on rice seed imported from Thailand. Since rice seed was in such critical supply during that period, many unauthorized shipments were made, with a resultant spread of the disease. Since then, it has attained epidemic proportions in many parts of the islands, local infections ranging from 20 to 40 percent.

Maize rust (*Puccinia sorghi*) was first reported on sweet corn imported from California and planted in the Mountain Province. More recently, another species, *Puccinia polysora*, probably introduced from

TABLE 1. *Annual importation into the Philippines of fruits and vegetables, 1951 to 1956.*

Year	Quantity imported, in metric tons					Value imported, in 1,000 Philippine pesos				
	Fruit	Potato	Onion	Garlic	Other vegetables	Fruit	Potato	Onion	Garlic	Other vegetables
1951	13 373	9 214	12 857	3 002	25 371	13 639	991	1 400	991	3 488
1952	13 224	2 290	9 153	1 839	15 412	3 342	622	974	578	2 214
1953	12 503	1 399	6 385	634	8 683	3 084	115	364	113	677
1954	9 902	611	3 277	1 237	5 255	2 373	53	440	322	882
1955	9 081	679	2 783	461	4 031	3 719	102	801	173	1 214
1956	7 480	1	4 287	661	8 515	1 649	1	553	171	1 839

southwest Africa (5), is causing severe losses not only in the maize-growing regions of Cagayan Valley but also at Cotabato on the Celebes coast. The disease is so destructive that it sometimes causes failure of an entire crop planted late in the season.

The east African giant snail (*Achatina fulica*), introduced from Japan during the Japanese occupation, has already spread to several provinces, destroying leafy vegetables and any other plants with succulent stems and leaves.

Of the noxious weeds which are not indigenous to the Philippines, the spiny *Mimosa invisa*, introduced from Java by the Tabacalera in 1924, is extremely destructive. It has spread throughout the Philippines and has become a major problem in Cagayan Valley, Davao, Cotabato and other parts of Mindanao. The lantana (*Lantana camara*) and the water lily (*Nymphea pubescence*) were both introduced from Hawaii as ornamentals but have become rather a nuisance. The former is a common and persistent weed in coconut plantations; the latter clogs rivers and waterways, obstructing navigation. Another introduction that interferes with cultivation is Johnson grass (*Sorghum halepense*), which was originally imported as a forage crop from Central America.

History and Organization of Plant Quarantine

Initial efforts to establish plant quarantine in the Philippines were made in 1912, when the Second Philippine Legislature enacted its first plant quarantine law, Act No. 2145, for the purpose of preventing the introduction of plant pests and diseases. However, due to lack of qualified personnel to serve as inspectors at that time, it remained inoperative.

In 1914, at the suggestion of the U.S. Federal Horticultural Board that an inspection service be inaugurated to facilitate the exportation of nursery stock from the Philippines into the United States, the Governor-General issued an order authorizing the Director of Agriculture to prescribe rules and regulations for the inspection of plant materials destined for exportation. Consequently, Act No. 2515 was decreed in 1915, providing a basis for action toward the prevention of exportation and importation of infested or diseased plant materials, as well as for the control of existing plant pests and diseases.

In pursuance of the authority granted by Act No. 2515, a plant inspection service was inaugurated during the latter part of 1915, beginning with the issuance of permits for imported plant materials. This function was performed by a small section under the Plant Industry Division of the Bureau of Agriculture. Originally, the work of this section was limited to locust control, a serious problem at the time. In 1919, the section was made a separate division, known as the Plant Pests Control Division, with a staff composed of a chief and three plant inspectors. This staff was increased during the following year to four assistant plant

inspectors, three junior plant inspectors and a number of manual workers. This newly created division, in addition to its work on plant inspection, was entrusted with field control of pests and diseases.

In order to establish a more comprehensive law which would permit effective measures to be put into operation, Act No. 2515 was revised and approved by the Fifth Philippine Legislature in 1922. This revised Act, referred to as Act No. 3027, which is still operative, provides measures for regulating the domestic movement of plant materials, as well as their importation from other countries.

In 1923, the Plant Pests Control Division was reorganized into three sections: Plant Diseases section, Plant Pests section and the Plant Inspection section. Since the war, this division has been renamed the Plant Pest and Disease Control Division, under the Bureau of Plant Industry, but its structure remains essentially the same.

Plant Quarantine Board

In accordance with Act No. 3027, an Advisory Plant Quarantine Board was established. Its main function is to advise the Director of Plant Industry in the promulgation of rules and regulations necessary for the prevention of the introduction of plant pests and diseases.

The members of the board are appointed by the Secretary of Agriculture and Natural Resources, on recommendation of the Director of Plant Industry. It is now composed of six members, with the Director of Plant industry as chairman and the Chief of the Plant Pest and Disease Control Division as executive secretary.

Foreign Quarantine

Further in accordance with Act No. 3027, administrative orders have been issued from time to time by the Bureau of Plant Industry (formally Bureau of Agriculture) for the proclamation of quarantine measures and the regulation of importation of specific plants. Some of the pests and diseases, which the Philippine quarantine is guarding against, include Mediterranean fruit fly (*Ceratitis capitata*), Mexican fruit fly (*Anastrepha ludens*), Queensland fruit fly (*Strumenta tryoni*), coffee berry borer (*Stephanoderes hampei*), sugar cane borer (*Diaprepes abbreviatus*), sugar cane gumming disease (*Xanthomonas vascularum*, dumbara disease of tobacco, rice nematodes, the swollen shoot virus of cacao, leaf blight (*Dothidella ulei*) of rubber.

For the purpose of minimizing the danger of introducing living insects and other small animals which may become agricultural pests, Act No. 3767, known as the Agricultural Pests Quarantine Act, was promulgated in 1930.

Port Inspection

During the early years, plant inspection was only effected at the Port of Manila; this was subsequently extended to the Port of Zamboanga. Since 1920, Iloilo, Cebu and other ports were opened to inspection, making a total of 12 ports where both incoming and outgoing plant materials are inspected, as follows: Manila, Iloiolo, Cebu, Zamboanga, Davao, Legaspi, Jose Panganiban, Aparri, San Fernando, Jolo, Tacloban, Cagayan de Oro.

At each of the 12 declared ports of entry there is a plant quarantine office in operation, which is adequately staffed and equipped with fumigation and other facilities necessary for the performance of its designated functions.

Internal Quarantine

The other phase of plant protection deals with the control of outbreaks of certain indigenous pests and diseases, as well as those which have accidentally been introduced and become established. Areas where such outbreaks are reported are placed under quarantine and the movement of host plants from infested places is prohibited.

At present the following pests and diseases have been proclaimed by administrative orders to be subject to quarantine:

a) East African giant snail
b) Coconut cadang-cadang disease
c) Abaca mosaic and other destructive diseases of abaca
d) Rice blast or neck rot
e) *Mimosa invisa*
f) Soybean stem-miner (*Melanagromyza sojae*)

In addition, administrative orders have been issued for the eradication or control of certain pests and diseases, such as coconut bud rot, black beetle (*Oryctes rhinoceros*) of coconut, toy beetle (*Leucopholis irrorata*) and allied species attacking sugar cane; Florida red scale (*Chrysomphalus aonidum*) and other scales on coconuts.

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Campaign Against the Mediterranean Fruit Fly in Costa Rica

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DURING the period 29 September through 12 November 1957, the writer was in Costa Rica to study the current situation of the Mediterranean fruit fly (*Ceratitis capitata*) and to assist the Government in planning the campaign for its control and eradication. In that period, he had the opportunity of discussing the problems involved with the Costa Rican officials,[1] primarily on the following subjects: (1) Establishment of a domestic quarantine against the Mediterranean fruit fly; (2) initiation of a detailed, countrywide survey, to determine as accurately as possible the area in Costa Rica that is definitely known to be infested by the fly; (3) eradication procedures to be followed in the future, taking into consideration the limited funds available; and (4) tentative determination of the amount of financial assistance that will be needed to bring the eradication campaign to a successful conclusion, as well as the length of time required.

Realizing the potential destructiveness of the pest and its effect upon the future agricultural program of Costa Rica, the officials whom the writer conferred with are intensely interested in doing all within their power to rid the country of the Mediterranean fruit fly. Furthermore, they fully comprehend the threat it presents to the agricultural production of the other Central American countries, Panama, Mexico and the southern United States, along the Mexican border.

During the course of discussions with the Costa Rican officials or with interested parties in neighboring countries, the following two questions always arise: (i) What is the status of this pest in Costa Rica at the present time; and (ii) What progress is being made in the campaign against the fly? In view of the limited time that the department engaged in the eradication campaign has been in existence, it would be difficult, and even excessive, to try to evaluate at this stage the progress it has achieved in eliminating the fruit fly from infested areas. Instead it would be more logical to describe the activities in which it is now engaged and the results it hopes to achieve in the future.

Countrywide Survey

The appointment of the present chief of the department engaged in the eradication campaign was effective as of 10 October 1957. It was apparent then that before eradication measures could be effectively taken, it would be necessary to know the exact distribution of the Mediterranean fruit fly in Costa Rica. Therefore, one of the first steps undertaken was to organize a countrywide survey. Although there was sufficient information available regarding the fly population throughout the Meseta Central and the Turrialba region, little or nothing was known of its distribution in the Provinces of Guanacaste and Limon, in the northern parts of the Provinces of Alajuela and Heredia, and in the southern parts of the Provinces of San José and Puntarenas. The greatest concern was felt about the possibility of the fly establishing itself in the vicinity of Puerto Limon on the east coast, Golfito on the south coast, along the Panamanian border where both citrus and coffee are grown, and in the northwestern part of the country along the Pan-American highway near Liberia.

The survey to determine the exact distribution of the Mediterranean fruit fly in Costa Rica was initiated on 29 October 1957. A total of 465 traps, all that were available at that time, were used to determine the fly

[1] The Costa Rican officials whom the writer had conferred with included: Ing. Teodoro Quirós C., Minister of Agriculture and Industries; Ing. Romano A. Orlich, Director-General of Agriculture and Livestock; Ing. Carlos Chavarría A., Chief of the Plant Quarantine Section; and Ing. Evaristo Morales, Chief of the department engaged in the campaign against the Mediterranean fruit fly.

distribution. These traps were placed in 124 localities where no surveys or only limited surveys had been made in the past, where light infestations had been noticed, and where the existence of the Mediterranean fruit fly has been suspected. The traps were distributed throughout the country in such a manner that all the provinces would be checked at those spots where the fly would be present if it existed within the province. In localities where well-established infestations were known to exist, no traps were placed, since there already was a sufficient amount of data available concerning infestations in those areas.

The results of the survey were, generally speaking, rather encouraging, in spite of the fact that the fly was trapped where it had not been trapped before, including places that contributed to an extension of the infested area. The fly was trapped for the first time in Tilarán in Guanacaste Province, and also in Palmares and Repunto in the south of San José Province. The presence of the fly in these two widely separated localities materially increased the known infested area in Costa Rica. Prior to this survey it was roughly estimated that one sixth of the country was infested. As a result of this survey, from the viewpoint of enforcing a domestic quarantine, it must be considered that approximately one fourth of Costa Rica is infested. However, in these two widely separated localities where the fly has been trapped for the first time, it appears that the infestation is highly localized. If this should prove true, then it is quite likely that the fly can be eradicated from these two localities and it has already been tentatively planned to carry out eradication.

Specimens were also trapped in other localities for the first time, but in those cases the presence of the fly did not materially increase the known range of the infested area. At the present time, the Mediterranean fruit fly is definitely known to occur in the following localities in Costa Rica:

Guanacaste Province: Tialarán;
Alajuela Province: Pital, Los Negritos, Aguas Zarcas, Los Chiles, Venecia, San Rafael, Cedral, San Roque, Quebrada Azul y Florencia, Florencia, Santa Clara, La Esperanza, Orotina, San Mateo, Atenas, Palmares, Grecia, Alajuela, Rio Segundo;
Heredia Province: Ujarrás de San Miguel, Barba, Santa Bárbara, San Antonio de Belén, San Rafael, San Isidro, San Pablo, Santo Domingo;
Cartago Province: Tres Ríos, Cartago-Paraíso, Orosi, Cachí, Juan Viñas, Turrialba, La Suiza;
San José Province: Palmares, La Bonita, Repunta, Moravia, Guadalupe, La Uruca, Alajuelita, Escasú, Santa Ana, Villa Colón, Puriscal, Tibás, Desamparados, San Ignacio, San Gabriel, Santa María de Dota, San Marcos (Tarrazú), El Higuito, San Rafael de Desamparados;
Puntarenas Province: La Rioja, Esparta.

Although the presence of the Mediterranean fruit fly in the above-mentioned localities would indicate that approximately 7,950 square kilometers in Costa Rica are infested, this figure is misleading and does not reveal the true picture. Some of these infested areas consist of mountain ranges, pastures and wasteland, where host plants of the fly are not encountered. In view of this consideration and the fact that certain infested areas are rather isolated, the facts seem somewhat more encouraging.

This countrywide survey is still being conducted and it is planned that this activity will continue as long as the eradication program is under way, in order that the progress of the campaign may be properly evaluated.

Control Operations and Domestic Quarantine

With the approach of the dry season in Costa Rica it is planned that the ground force will intensify its spraying operations. Particular attention will be paid to the isolated areas of infestation, with the hope of reducing materially the known infested areas and preventing the further spread of the fly. However, if the fly is to be eradicated from the Meseta Central and the Turrialba region, it will be necessary to use planes. The problem confronting the department engaged in the campaign is not the feasibility of using planes but securing sufficient funds to finance this type of operation. Without the

use of planes the best the ground force can do is to confine the fly and prevent, or perhaps only retard, its spread.

As a further aid in preventing the spread of the Mediterranean fruit fly from infested areas to non-infested areas, the Costa Rican Government has already taken the necessary steps to adopt a domestic quarantine against this pest. This quarantine, which will appear as an emergency decree, has already been approved by the Minister of Agriculture. There will also be pre-flight inspection of all airplanes leaving the airports located in the infested zones. In order that this decree might be properly enforced, a special training course was organized for the seven inspectors who will be stationed at strategic points to prevent the movement of fruit and vegetables from infested to non-infested areas.

Seasonal Variation in Fly Population

It is interesting to note that during the rainy season routine trapping operations conducted throughout the areas previously known to be infested have revealed a very low adult population. In view of the fact that this situation has been encountered each year since the Mediterranean fruit fly was first discovered in Costa Rica, it may be concluded that heavy rains have an inhibiting effect upon the fly population. It should be remembered, however, that while judging from data collected from the limited number of traps in use, the fly population was undoubtedly at a low ebb. A larger number of traps would have to be employed if a completely accurate picture of the over-all population level were to be secured.

To indicate more clearly the effect that the rainy season has upon the adult population, it would be well to describe the situation that existed during the writer's last visit to the Turrialba region in October and November 1957. At that time, the writer conducted a tour with a group of twelve students to several areas where ripe coffee berries could be found. In spite of the fact that thirteen people were examining ripe coffee berries with a great deal of care for fly larvae, only two specimens were found. Nevertheless, in these same areas during May and June of the same year, it was difficult to find a ripe coffee berry that was not attacked by one to three larvae.

Unfortunately, in spite of the reduction of the adult population during the rainy season, the situation quickly reverses itself once the dry season begins. Commencing in January, the adult population starts to build up gradually. By April, the adult population reaches just about its peak and a leveling-off process follows. Then, as rains become more frequent and heavy, there is again a gradual reduction of fly population. The rainy season and the presence of mountain ranges have been important contributing factors in preventing the rapid spread of the Mediterranean fruit fly in Costa Rica. Unfortunately, infested fruit has been transported over the natural barriers by man, and the fly is now in a favorable position to increase its range unless a properly financed eradication program is put into effect.

Host Range

The host range of the Mediterranean fruit fly is also increasing in Costa Rica. At the early stage after the fly was first discovered, its preferred host on the Meseta Central was the sweet orange. When it was first encountered in the Turrialba region, the preferred host there was coffee berries. Since then, the fly has extended its host range on the Meseta Central to mangoes (*Mangifera indica*), star-apples (*Chrysophyllum cainito*), hog plums of the genus *Spondias* and coffee berries. It has also been recorded on guava (*Psidium guajava*) once. At the present time, mangoes seem to be attacked as severely as oranges on the Meseta Central, with star-apples and coffee berries being next as preferred hosts. In the Turrialba region, it still appears as though coffee is the preferred host, and although oranges are plentiful, they do not seem to be under attack. Undoubtedly, as more investigations are carried out as regards host preference, further fruits will be discovered as being attacked by the fly.

Conclusion

The foregoing summarizes briefly the situation of the Mediterranean fruit fly as it exists in Costa Rica. The fly has certainly extended its geographic range but it is still

not out of hand. It should be stressed that this is the year when the fly may begin to spread more rapidly in both north and south, for it has apparently been transported by man over some of the natural barriers that formerly restricted its movement. The seriousness of such a situation, should it arise, can only be countered by the present eradication campaign, which is progressing satisfactorily. It is hoped that this campaign will not only continue but that every possible modern method will be placed at its disposal.

Wedelia, a Host of Sunflower Rust in Peru

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SINCE sunflower rust, *Puccinia helianthi* Schw., was found near Lima in 1950, this disease has become an important problem in the cultivation of sunflower as a forage crop in the central coastal area of Peru. Research has been initiated since then to develop sunflower varieties resistant to the rust. Through studies undertaken in collaboration with the Morden Experimental Station, Manitoba, Canada, considerable progress has been made in this connection.[1]

During trips to different parts of the country to investigate wheat rusts, the writer also made efforts to find wild or ornamental sunflowers that might be of use in the breeding of better sunflower varieties. On several occasions he observed plants belonging to the genus *Wedelia* (Compositae), locally known as "Sunchu," being infected by a rust which was later identified as *Puccinia helianthi*. The discovery of *Wedelia* as a new host of *P. helianthi* is of importance because this genus is widespread in Peru and therefore may facilitate the dissemination of the rust, causing increased damage to sunflower cultivation.

Wedelia was found to be attacked in various degrees by a complex of rust races which are apparently different from those attacking sunflower in the coastal area. Sunflower is susceptible to the rust of *Wedelia* but the sunflower rust of the coastal area does not infect *Wedelia*. If this is sustained by future work, the breeding of sunflower for rust resistance will have to take into account the rust race or races originating from *Wedelia*.

While *Puccinia helianthi* is known as an autoecious species, the rust from *Wedelia* does not appear to complete its life cycle on *Wedelia*, because only the uredial and telial stages have been found on this host but not the pynidial or aecial stage.

It is of interest to note that some *Wedelia* plants were found to be free from rust infection. This would offer an opportunity for developing resistant strains, permitting the growing of *Wedelia* as a fodder crop without the danger of spreading the rust.

In order to determine the geographic distribution of the genus *Wedelia* in the country, surveys have been carried out in different regions and seeds have been collected from various sources for further examination. Surveys made in the interior of the Departments of Lima and Junin and in Abancay, Ayacucho and Cuzco in the south, show that *Wedelia* is widespread in the central and southern parts of the Andes. During a recent trip to the north, *Wedelia* was found on the banks of the river Moche 30 kilometers from Trujillo near the sea, but they were free from rust. Traveling to the inland toward the mountains, *Wedelia* was seen more abundantly and with increasing rust infection. In the provinces of Otuzco, Santiago de Chuco and Huamachuco of the Department La Libertad and in the Provinces Cajabamba, Cajamarca and Contumazá of the Department of Cajamarca, *Wedelia* was also uniformly distributed. In all those areas 11 samples of apparently different types of *Wedelia* were collected and they have been grown in pots for multiplication to provide material for botanical classification and rust tests.

The *Wedelia* plants collected are perennial herbs with yellow flower heads. Based on the most conspicuous morphological differences, the plants can be grouped in the following three types:

[1] ROJAS, E. and A.F. SWANSON. 1955. Hacia la creación de tipos de girasol resistentes a la roya. *Bol. Trim. Exp. Agropecuario* 3 (4): 2-6.

Type A. Stems and leaf veins green, seed gray and winged.

Type B. Same as type A except that seed has no wing.

Type C. Stems and leaf veins purple, seed purple.

Type C is the dominant type in the mountain areas; types A and B are common in the coastal area but not in the mountains. The uredial stage of *Puccinia helianthi* was found on all three types but the telial stage was found only on type C.

In view of the above finding, studies on sunflower rust will include the following phases: (1) identification of the species of *Wedelia* that occur in Peru; (2) determination of the geographical distribution of *Wedelia* spp.; (3) search for other species of Compositae which may be hosts of *Puccinia helianthi*; (4) determination of rust races that attack sunflower as well as *Wedelia* and establishment of differential varieties for this purpose; and (5) determination of the susceptibility of sunflower selections to different rust races.

Outbreaks and New Records

Pakistan

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Fusarium acridiorum, a Parasite of Desert Locust

DURING the regression period of 1954–1956, very few specimens of desert locust (*Schistocerca gregaria*) were available in the field. The collections made during that period from various areas in West Pakistan were reared in the laboratory under cages. During the process of rearing and mass multiplication of the locusts, it was noticed that a number of oviposition tubes containing locust eggs failed to hatch. When kept under suitable moisture at room temperatures ranging between 70°–90° F., a sparse cottony white mycelial growth developed on eggs. This fungus was obviously different from the one reported previously [1] and it has been identified as *Fusarium acridiorum* (Trab.) Brongn. & Delacr.

The macroconidia of the fungus are sickle-shaped, mostly three septate and hyaline, measuring 26.6–30.4 × 3–4 μ. The microconidia are oblong, terete, falcate or ovoid, 0–1 septate and hyaline, measuring 4–19.0 × 3–5 μ. The chlamydospores are echinulate, hyaline, both intercalary and apical within the hyphae as well as within macroconidia. Its morphological characters compare favorably with those described by Saccardo [2] and Marchionatto, [3] spore sizes being within the ranges given by them.

Different species of *Fusarium*, such as *F. acridiorum*, *F. solani* and *Fusarium* sp., have been reported as parasites of Acrididae in various countries, including *Schistocerca gregaria* in Algeria, Morocco and the U.S.S.R., *Schistocerca paranensis* in Argentina, *Nomadacris septemfasciata* in South Africa, *Dociostaurus maroccanus* in Anatolia, and *Locusta migratoria gallica* and other species as well as grasshoppers in the U.S.S.R.

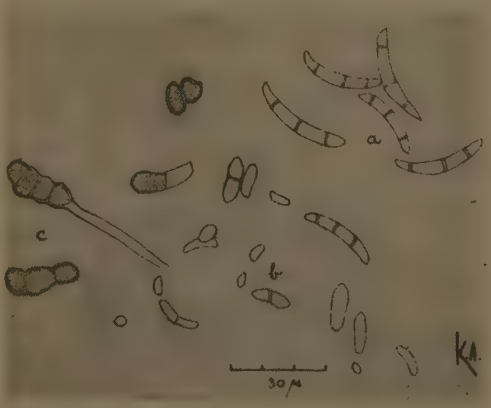

Figure 1. Fusarium acridiorum parasitic on eggs of desert locust: a) macroconidia; b) microconidia; c) chlamydospores.

It is obvious from literature that *Fusarium* spp. are capable of parasitizing different species of Acrididae. The exact mode of attack and the parasitic potential of *Fusarium acridiorum* are under study. It may, however, be mentioned that the fungus is recorded here for the first time for the Indo–Pakistan subcontinent.

The authors wish to express their gratitude to Dr. Taskhir Ahmad and Mr. Azmat Ullah Khan for valuable criticism and guidance.

[1] HASAN, S.F., HESHAMUL HAQUE and M. HASHIR. 1957. A fungus parasite of desert locust (*Schistocerca gregaria* Forsk.). *Abst. Biol. Sect. All. Pakistan Sci. Conf. Lahore.* 27 p.

[2] SACCARDO, P.A. 1892. *Sylloge Fungurum 10* : 728.

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Plant Quarantine Announcements

New Zealand

Plant Quarantine Regulations of 25 September 1957, published in the *New Zealand Gazette* of 26 September 1957, revoke Plant Quarantine Regulations 1952 and Amendment No. 1 of 1953. In addition to the provisions summarized below, procedures at ports of entry, inspection and treatment of overseas aircraft and post-entry quarantine are also provided in the Regulations.

Imports Prohibited from All Places

1. Any fungus, bacterium or virus or any living invertebrate animal which may injure plant.
2. Citrus stocks, seedlings and budded or grafted trees (except citrus seed).
3. Conifers of the genera *Abies, Cedrus, Larix, Picea, Pinus, Pseudotsuga, Sequoia, Thuja, Tsuga.*
4. Thornapple (*Datura* spp.).
5. Hop (*Humulus* spp.) including hop sets, dried hops and seed.
6. Tobacco (*Nicotiana* spp.) plants including seed.
7. *Ribes* spp., including seed.
8. *Rubus* spp.
9. Potato (*Solanum tuberosum*) plants and seed, excluding tubers.
10. *Solanum* spp. others than *S. tuberosum*, excluding seed.
11. Blueberry (*Vaccinium* spp.) excluding seed.

Imports Prohibited from Specific Places

1. *Araucaria* spp., excluding seed, from North America.
2. Chestnuts (*Castanea* spp. and *Castanopsis* spp.) including seed, from China, Japan, India, North America and Europe.
3. Ash (*Fraxinus* spp.) excluding seed, from Great Britain, Republic of Ireland and Europe.
4. Sunflower (*Helianthus annuus*), including seed, from Argentina.
5. Walnuts (*Juglans* spp.), excluding seed, from North America.
6. *Juniperus* spp., excluding seed, from North America.
7. Poplars (*Populus* spp.) excluding seed, from North America, Great Britain, Republic of Ireland and Europe.
8. Oaks (*Quercus* spp.), excluding seed, from North America and Japan.
9. Willows (*Salix* spp.) from Europe, Great Britain, Republic of Ireland and North America.
10. Elms (*Ulmus* and *Zelkova* spp.), including seed, from North America, Europe, Great Britain and Republic of Ireland.
11. All fruits and vegetables from places where the oriental fruitfly (*Dacus dorsalis*) exists.
12. Fruit from places where harmful species of fruit flies (Trypetidae) exist, except fruit permitted under "Imports Restricted."
13. Citrus fruit from places where citrus canker (*Xanthomonas citri*) exists.
14. Sweet potatoes (*Ipomoea* spp.), except seed, from Australia, North America, Continent of Asia, Tonga, Fiji and other places where kumara weevil (*Euscepes postfasciatus*), sweet potato weevil (*Cylas formicarius*), internal canker virus, curly top virus, or soil rot (*Actinomyces* sp.) exists.
15. *Prunus* spp., e. g. peach, plum, apricot, cherry and almond including seed, from Europe, Asia, Great Britain, Republic of Ireland, North and South America, Australia and other places where brown rot (*Sclerotinia fructigena* and *S. laxa*) or virus diseases exist.
16. *Pyrus* spp., e. g. apple, pear and quince excluding seed, from Europe, Great Britain, Republic of Ireland, North and South America and other places where brown rot is known to exist.
17. Potato tubers from all places where potato wart (*Synchytrium endobioticum*), ring rot (*Corynebacterium sepedonicum*), yellow dwarf, Colorado beetle (*Leptinotarsa decemlineata*) or golden eelworm (*Heterodera rostochiensis*) exists.
18. Grapevine (*Vitis* spp.), excluding seed, from Europe, North America and other places where vine mosaic virus or Pierce's disease exists.

Imports Restricted

A health certificate is required to accompany any consignment of fruit, plants, nursery stock or seed to be introduced. The certificate should be in the form annexed to the International Plant Protection Convention, and signed within 14 days before dispatch by an authorized officer of the appropriate service in the country or place of origin, and should contain such further certificates as required in respect of a particular plant or plant product.

1. *Bulbs, corms, rhizomes and tubers of ornamental plants.* Where on inspection the consignment has been found infested with insect pests, the certificate should include particulars of the treatment to which the consignment has been subjected.

In case of gladioli, lilies, rhizomatous irises or tulip, the certificate should be endorsed to the effect that they were inspected during the previous growing season and found to be substantially free from injurious pests and diseases, including virus diseases. Otherwise, they will be placed in post-entry quarantine or otherwise treated. This provision will come into force on 1 March 1958.

2. *All fruit, including tomatoes,* except those from countries where oriental fruit fly or any other harmful fruit fly exists, and those otherwise specifically restricted in the Regulations. The certificate should indicate that clean new packages are used.

3. *Fruit, including tomatoes and citrus fruit from Pacific Islands,* where oriental fruit fly does not exist and, in the case of citrus fruit, citrus canker does not exist. The certificate should indicate that the fruit has been fumigated with hydrogen cyanide for at least one hour, or otherwise treated by an approved method, and is packed in clean packages not previously used, and that in the case of citrus fruit, citrus canker does not occur in the place of origin.

Where the consignment consists of unripe bananas, lemons, limes, pineapples or tomatoes fumigation will not be necessary, but the certificate should indicate that the fruit was shipped or transported in an unripe condition.

Bananas may be imported from Norfolk Island in a colored condition if accompanied by a health certificate.

4. *Unripe bananas, lemons, limes and pineapples and any fruit not the host of harmful fruit flies* (Trypetidae) from places other than the Pacific Islands, except where oriental fruit fly exists and, in the case of lemons or limes, where citrus canker exists. The certificate should indicate that the fruit is packed in clean new packages and is free from scale insects, or has been effectively fumigated, and in the case of lemons or limes, that citrus canker does not occur in the place of origin. Where the consignment consists of unripe bananas, lemons, limes or pineapples when shipped or transported, the certificate should so indicate.

5. *Citrus fruit* (except unripe lemons and limes) from any place or country (other than a Pacific Island) where oriental fruit fly does not exist. The certificate should indicate that citrus canker does not occur in the place of origin, that the fruit was grown and packed in an area at least 50 miles from an area infested with harmful fruit fly (Trypetidae), that the fruit is free from scale insects or has been effectively fumigated and is packed in clean new packages. The restrictions with regard to harmful fruit flies and scale insects may be exempted, if one of the following requirements has been fulfilled:

a) Before being shipped the fruit has been cooled in an approved cool store to 31° F. (± 1° F.) for at least 21 consecutive days and if not shipped immediately thereafter it should be continuously held in the cool store at 40° F. or less until shipment. A signed thermograph chart covering this period should accompany the consignment and the health certificate should indicate, in addition to reference to citrus canker and new packages, that the fruit has been cool-stored before shipment.

b) The fruit has been cool-stored during transport and, if possible, also at the place of loading. The cool store at the place of loading (if any) should be approved by the Director of Agriculture and the refrigerated compartment of the vessel should be equipped with forced air circulation and temperature-recording instruments. After loading and during transport, the fruit should be held at 31° F. (± 1° F.) for at least 21 consecutive days during transport [(or 31° F. for 14 days) for fruit from areas infested with Mediterranean fruit fly (*Ceratitis capitata*) and Queensland fruit fly, (*Strumata tryoni*)] and 40° F. afterward, until arrival. If the period of transit does not permit this, the fruit should be first pre-cooled on land and loaded in such a manner that the temperature of the fruit does not rise above 34° F.; after loading the fruit shall be cooled to 31° F. and held at 31° F. for the requisite period. Records showing the temperature of the fruit during the transit are required, and the health certificate should indicate, in addition to references to citrus canker and new packages, that the fruit was cooled before shipment or loaded on ship without being cooled.

6. *Grapes* from any country or place except where oriental fruit fly exists. The certificate should indicate that the fruit was grown and packed in an area not less than 50 miles from an area infested with any harmful fruit fly (Trypetidae), that no grape vine foliage or wood is attached to the fruit, and that the fruit is packed in clean new packages.

Notwithstanding the restriction regarding harmful fruit flies, grapes may be imported if they have been cool-stored before shipment or shipped in cool store chambers on the vessel, and the provisions governing the cool-storing of citrus fruit before shipment or the conveyance of citrus fruit in cool store during shipment shall apply, with necessary modifications. The health certificate should contain a certificate to this effect, in addition to references to freedom from foliage and wood and to new packages.

7. *Vegetables,* excluding tomatoes, from any country or place except where oriental fruit fly

exists. The health certificate should indicate that the consignment is packed in clean new packages and is reasonably free from soil. Sweet potatoes, however, may be imported from any place where oriental fruit fly exists.

8. *Potato tubers for consumption* from any place or country where any disease or pest subject to prohibition does not exist. If second hand packages are used, a permit should first be obtained from the Director of Horticulture. The health certificate should indicate that yellow dwarf virus, ring rot, wart disease, Colorado beetle, and golden eelworm do not occur in the place of origin, that the tubers are reasonably free from soil, packed in clean new packages or in authorized second hand packages.

9. *Potato tubers for seed* from any country or place. A permit must first be obtained from the Director of Horticulture, authorizing introduction subject to such conditions as he thinks fit, including postentry quarantine. A person may not import more than 28 pounds in a year. The health certificate should indicate that yellow dwarf virus, ring rot, wart disease, Colorado beetle, and golden eelworm do not occur in the place of origin, that the seed potatoes are free from soil, and packed in clean new packages.

10. *Nursery stock* from any country or place, except certain kinds, the importation of which is prohibited. A permit must first be obtained from the Director of Horticulture, authorizing introduction subject to such conditions as he thinks fit, including postentry quarantine. Each species included in the consignment should be labelled and the health certificate should, in the case of citrus stock, indicate that canker does not occur in the place of origin.

"Nursery stock" means every kind and species of plant, including bud wood, scions, and other portions of a plant, but does not include potatoes and other vegetables, fruit, seeds, or the propagating organ of any ornamental plant.

Import permit is not required for the following plants and any other plant that the Director of Horticulture may authorize.

a) Aizoaceae
Bromeliaceae
Cactaceae
Crassulaceae
Marantaceae
Musaceae
Nepenthaceae
Orchidaceae

b) *Alocasia*
Aloe
Anacampseros
Anthurium
Caladium
Codiaeum
Colocasia
Dieffenbachia
Haworthia
Hibiscus
Monstera
Philodendron
Rhoeo
Saintpaulia
Sansevieria
Spironema
Stapelia
Zantedeschia

c) Acalypha plants (*Acalypha* spp.).
Lapageria plants (*Lapageria rosea*).
Frangipani plants and cuttings (*Plumeria acutifolia* and *P. rubra*).
All species of ferns, Filicineae, except *Pteridium esculentum*.
Spawn of common mushroom (*Agaricus campestris*)

11. *Seeds* from any country or place, except certain seeds, the introduction of which is prohibited. They must be substantially free from extraneous matter or cleaned or treated on arrival. A health certificate is required to accompany all seed except flower seed. In the case of maize, sweet corn, or popcorn seed (*Zea mays*), the certificate should indicate that the seed-producing crop was officially inspected, that bacterial wilt (*Xanthomonas stewarti*) was not found in the crop, nor had been recorded previously in the area, and that the seed has been treated for the control of smut (*Ustilago zeae*) and brown spot (*Physoderma zeae-maydis*) with an organic mercurial or, some other effective method. In the case of sweet corn or corn on the cob, it should be stated that the above-mentioned three diseases do not occur in the country of origin. For tomato seed, the certificate should indicate that it has been extracted by hydrochloric acid or other approved method to destroy tobacco mosaic, tomato speck (*Pseudomonas tomato*), canker (*Corynebacterium michiganense*) and stem rot (*Didymella lycopersici*). For alfalfa seed, it should state that bacterial wilt (*Corynebacterium insidiosum*) does not occur in the place of origin. If the country or place of export of any seed other than maize, sweet corn and popcorn seed is not the country or place of origin, the certificate may be signed by an authorized officer in the exporting country.

Imports Not Requiring Certificate

The following plant materials may be imported without a health certificate but are subject to inspection on arrival:

1. Stored products (dried fruit, grain, edible nuts or other plant products not for planting or propagation, but excluding fresh fruit and vegetables or any manufactured or processed plant product).
2. Cut flowers.
3. Flower seeds.

Packing Material

The following packing materials, if free from diseases and clean, may be used for nursery stock, plants or seeds: moss, sawdust, ground cork, woodwool, vermiculite, charcoal, or vegetable fiber free from pulp.

Import of Soils

The importation of any soil, sand, clay or earth, as such, or adhering to plants or other goods, as packing, ballast for aircraft or vessel, is prohibited, unless with the consent of the Director-General of Agriculture or the inspector. Soil, sand, clay or earth may only be imported for processing or manufacture, for scientific purpose, or as ballast for ship or vessel, to be discharged into the sea or landed under official supervision. Clean sand may be used as ballast for aircraft if landed and stored under official supervision.

Imports for Special Purposes

Notwithstanding the above-mentioned prohibitions or restrictions, any nursery stock, fruit, plant, insect or other material may be imported for scientific or other specific purposes, if a prior permit in writing has been obtained from the Director of Horticulture, subject to the conditions specified therein.

Ports of Entry

Plants, seeds, nursery stock, fruit, vegetables and stored products may be imported through the ports of Auckland, New Plymouth, Wellington, Lyttelton, Timaru, Dunedin, Port Chalmers and Bluff, and the airports of Whenuapai, Ohakea, Paraparaumu, Harewood, Mechanics Bay, Evans Bay and Bluff.

Fruit, vegetables and stored products may also be imported, through the ports of Mount Maunganui, Gisborne, Napier, Wanganui, Nelson, Picton and Oamaru.

News and Notes

FAO Meeting on Olive Fly Control

The Third FAO Meeting on the Control of the Olive Fly, held in Florence, Italy, 25-30 November 1957, was attended by representatives of France, Greece, Israel, Italy, Libya, Morocco, Portugal, Spain, Yugoslavia, U.S.A. (International Cooperation Administration), the European and Mediterranean Plant Protection Organisation (EPPO) and the International Commission for Biological Control (CILB).

The progress achieved in olive pest control since the last meeting (1955) was examined, and it was concluded that insecticides and application methods are now available for satisfactory control of the olive fly (*Dacus oleae*) and the olive kernel borer (*Prays oleellus*). It was, however, felt that no one method alone could give the desired degree of protection and that the different methods should be used in combination according to the ecological conditions prevailing in the different regions of the Mediterranean. Generally, it was suggested that insecticides be used with proper attractants early in the season, as a preventive method, supplemented by one or two curative sprays in the fall, according to the degree of infestation.

Reports were presented on tests with new insecticides having low toxicity to warm-blood animals, relatively short residual action, and which apparently do not leave any toxic residues in the olive oil, but the meeting was reluctant to recommend the extensive use of such insecticides before more is known on their long-term toxicity.

Methods for the removal of insecticide residues from the oil in the process of refining were discussed, and several recommendations were made for biological and ecological studies on the olive fly, for more effective control of this insect.

Co-operative Studies on Wheat Rusts in Europe

International Yellow Rust Trials. At the proposal of the Netherlands Grain Centre, a standard collection of wheat varieties has been grown in various places in Europe since 1955, for the purpose of gathering information relating to the epiphytotics of yellow rust (*Puccinia glumarum*) of wheat, such as the date of first appearance of the rust, the development of outbreaks, the distribution of physiologic races and the susceptibility of wheat varieties. With the co-operation of many

institutions and wheat breeders, a collection consisting of 30 to 50 wheat varieties was grown in 1955 at 50 locations. Rust samples were sent to the *Biologische Bundesanstalt für Land und Forstwirtschaft* at Brunswick for isolation and determination of physiologic races. In 1956, 49 trials were carried out throughout northern and central Europe and the number of wheat varieties in the standard collection was reduced to a maximum of 30 to facilitate a more thorough study.

During the growing season of 1957, when yellow rust was prevalent in many parts of Europe, 94 of the 149 trials were found to be infected. The more severe outbreak was reported from the seaclay districts of Belgium and the Netherlands, attacking varieties Heine's VII and Alba. Varieties Carsten's VI, Flamingo and Leda were also attacked at the early stage of development, but those varieties proved to be resistant at later stages. South of Ostende in Belgium yellow rust was light, but it spread southwest as far as the south of Paris. Outbreaks were reported from the northwest and west of Germany. In Switzerland, the wheat variety Probus was severely attacked at some locations. In Great Britain, yellow rust infection was light throughout the country.

European Yellow Rust Conference. The cooperative undertaking in the rust trials created the need for a discussion of the many problems involved in yellow rust studies. Consequently, a European Yellow Rust Conference was convened at Brunswick, 21-22 February 1956, under the auspices of the *Biologische Bundesanstalt für Land- und Forstwirtschaft* and the Netherlands Grain Centre. The Conference made arrangements for the intercountry exchange of information concerning yellow rust resistance of wheat varieties and breeding stocks, and agreed upon uniform scales for defining the growing stages of wheat, the infection types of yellow rust, and the extent of rust attacks. It was also arranged that the *Institut für physiologische Botanik* of the *Biologische Bundesanstalt* at Brunswick would undertake the determination of yellow rust races for Europe, and that the *Max-Planck Institut für Züchtungsforschung* at Köln-Vogelsang would undertake the multiplication of seed of differential varieties for the determination of yellow rust races.

European and Mediterranean Stem Rust Nurseries. During the Fourth International Congress of Crop Protection, held in Hamburg in September 1957, a co-operative scheme for studying wheat stem rust (*Puccinia graminis*) in south Europe and the Mediterranean region was initiated through the efforts of a group of plant pathologists engaged in rust research. It was arranged that a standard collection of wheat varieties would be sown in various countries in south and southwestern Europe, as well as in the Mediterranean, in order to gather information on the distribution and dissemination of stem rust races. Spore traps are also to be installed at appropriate places in the area. The Congress also adopted a resolution urging all European countries to cooperate closely in cereal rust studies.

Roma - Tip. del Senato del dott. Giovanni Bardi

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